

Claims

We claim:

1. In a computer system, a method for converting a hierarchical data structure into a flat data structure comprising the steps
5 of:

a) converting said hierarchical data structure into an input data tree comprising nodes, said nodes containing the data elements of said hierarchical data structure and said nodes linked together in a parent-child relationship, said parent-child relationship derived from the
10 hierarchical data structure;

b) constructing a shape tree corresponding to the input data tree by collapsing nodes of said input data tree containing redundant elements into one node;

c) annotating said shape tree nodes with properties describing the
15 hierarchical relationships between elements of the input data tree;

d) building a list of column names for said flat data structure deriving said column names by tracing said shape tree; and

e) emitting data from said input data tree into proper columns and row of said flat data structure.

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2. The method in Claim 1, wherein said properties include a first property specifying the maximum number of times a given element appears inside its parent across the entire input tree.

5 3. The method in Claim 1, wherein said properties include a first property specifying the maximum number of times a given element appears inside its parent across the entire input tree and a second property set equal to false if and only if the node's first property is greater than zero or if the node has any child nodes that have a second
10 property set to false.

4. The method in Claim 1, wherein said properties include a third property set to true if the node has any child nodes.

15 5. The method in Claim 1, wherein said properties include a forth property set to true if and only if every occurrence of the element corresponding to the node contains numeric data.

20 6. The method in Claim 1, wherein the format of the data structure of said hierarchical data structure is XML.

7. The method in Claim 1, wherein said flat data structure is readily usable by an electronic spreadsheet.

8. The method in Claim 1, wherein:

5 said properties include;

a first property specifying the maximum number of times a given element appears inside its parent across the entire input tree,

10 a second property set equal to false if and only if the node's first property is greater than zero or if the node has any child nodes and anyone of said child nodes have a second property set to false, and

a third property set to true if every occurrence of the element corresponding to the node contains numeric data; and

wherein a column name is generated for said flat data structure

15 when said second and said third properties are both true.

9. The method in Claim 1, wherein:

said properties include;

a first property specifying the maximum number of times a given element appears inside its parent across the entire input tree,

20 and

a second property set equal to false if and only if the node's first property is greater than zero or if the node has any child nodes that have a second property set to false; and wherein a column name is generated for said flat data structure 5 when said first and said second properties are both true.

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10. A computer system for converting a hierarchical data structure into a flat data structure, the system comprising:

5 a memory for storing said hierarchical data structure and said flat data structure; and

a processing unit functionally coupled to the memory, for executing computer-executable instructions operable for:

10 converting said hierarchical data structure into an input data tree comprising nodes, said nodes containing the data elements of said hierarchical data structure and said nodes link together in a parent-child relationship in the same fashion as the data elements they contain were linked in the hierarchical data structure,

15 constructing a shape tree corresponding to the input data tree by collapsing nodes of said input data tree containing redundant elements into one node, said intermediate data structure retaining the same parent-child relationship of the input data tree,

20 annotating said shape tree nodes with properties describing the hierarchical relationships between elements of the input data tree,

building a list of column names for said flat data structure utilizing said intermediate data structure as annotated, and

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emitting data from said input data tree into proper columns and row of said flat data structure.

11. The system in Claim 10, wherein said properties include a
5 first property specifying the maximum number of times a given element appears inside its parent across the entire input tree.

12. The system in Claim 10, wherein said properties include a
first property specifying the maximum number of times a given element
10 appears inside its parent across the entire input tree and a second
property set equal to false if and only if the node's first property is
greater than zero or if the node has any child nodes that have a second
property set to false.

15 13. The system in Claim 10, wherein said properties include a
third property set to true if the node has any child nodes.

14. The system in Claim 10, wherein said properties include a
forth property set to true if and only if every occurrence of the element
20 corresponding to the node contains numeric data.

15. The system in Claim 10, wherein the format of the data structure of said hierarchical data structure is XML.

16. The system in Claim 10, wherein said flat data structure is
5 readily usable by an electronic spreadsheet.

17. The system in Claim 10, wherein:
said properties include;

10 a first property specifying the maximum number of times a given element appears inside its parent across the entire input tree,

15 a second property set equal to false if and only if the node's first property is greater than zero or if the node has any child nodes and anyone of said child nodes have a second property set to false, and

20 a third property set to true if every occurrence of the element corresponding to the node contains numeric data; and wherein a column name is generated for said flat data structure when said second and said third properties are both true.

20 18. The system in Claim 10, wherein:
said properties include;

a first property specifying the maximum number of times a given element appears inside its parent across the entire input tree, and

5 a second property set equal to false if and only if the node's first property is greater than zero or if the node has any child nodes that have a second property set to false; and

wherein a column name is generated for said flat data structure when said first and said second properties are both true.

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